ABSTRACT

[0001]A system, ablation probe, and method is provided for treating tissue, e.g., tissue having tumors. The treatment system is configured to automatically deliver infusaid to tissue when needed and comprises an ablation probe having an ablative element and at least one perfusion exit port. The system further comprises an ablation source operably coupled to the ablative element, and a pump assembly operably coupled to the perfusion exit port(s). The pump assembly is configured for pumping infusaid out through the perfusion exit port(s), preferably during the ablation process. The system further comprises a feedback device configured for controlling the amount of infusaid displaced by the pump assembly based on a sensed tissue parameter, e.g., tissue temperature or tissue impedance. For example, the feedback device can comprise a sensor configured for sensing the tissue parameter, and a perfusion controller configured for controlling the pump assembly based on the sensed tissue parameter. As another example, the feedback device can comprise a perfusion valve associated with the distal end of the shaft. In this case, the perfusion valve forms the perfusion exit port, wherein the perfusion valve changes the size of the perfusion exit port based on tissue temperature.

[0002]An ablation probe is provided for treating tissue, e.g., tissue having a tumor. The ablation comprises an elongated shaft, an ablative element, a perfusion lumen that extends through the probe shaft, and a perfusion control valve associated with the distal end of the shaft. The perfusion control valve has a port, the size of which changes with temperature. In one embodiment, the perfusion control valve comprises a reed valve having at least one reed, e.g., a pair of opposing reeds, or even four reeds. The reeds are

configured change shape in order to control the size of the port. For example, each reed can comprise a bi-metallic flange or a nitinol flange that bends in the presence of a temperature change.

[0003] Ablation probes and systems are provided for treating tissue, e.g., tissue having a tumor. The ablation comprises an elongated shaft, an ablative element, a perfusion lumen that extends through the probe shaft, and at least one perfusion exit port in fluid communication with the perfusion lumen. The perfusion lumen can be used to deliver an infusaid to the perfusion exit port(s) for perfusion of the surrounding tissue. The ablation probe further comprises a wicking material, e.g., cotton or fabric, disposed in the perfusion lumen. In this manner, the infusaid that travels through the perfusion lumen can be controlled without regard to the size of the perfusion exit port(s).

[0004] An ablation probe is provided for treating tissue, e.g., tissue having a tumor. The ablation probe comprises an elongated shaft, an ablative element, a perfusion lumen that extends through the probe shaft, and at least one perfusion exit port in fluid communication with the perfusion lumen. The ablation probe further comprises a pump assembly carried by the proximal end of the shaft. The pump assembly is configured for pumping infusaid through the perfusion lumen and out the perfusion exit port(s). In one embodiment, the pump assembly comprises a reservoir for storing the infusaid, and a perfusion inlet port configured for transferring infusaid from an external source into the reservoir. The pump assembly can be variously configured. For example, the pump assembly may comprise a diaphragm adjacent the reservoir. In this case, the diaphragm has pumping stroke that displaces the infusaid from the reservoir into the perfusion lumen.

As another example, the pump assembly comprises a diaphragm adjacent the reservoir, wherein the diaphragm is configured for expanding to pressurize the reservoir in response to the conveyance of infusaid into the reservoir. As still another example, the pump assembly comprises a plunger disposed in the reservoir and a spring configured to urge the plunger within the reservoir in one direction to pressurize the reservoir.